AP-IS POLICY BRIEFS

NO.4, 27 MARCH 2020

Enhancing the role of ICTs for Disaster Risk Management

"With advances made in technology, the sophistication of systems currently in place and the rapid pace at which new technologies and solutions emerge, Information and Communication Technology (ICT) is proving to be an increasingly important tool in Disaster Risk Management (DRM)."

Building e-resilience: Enhancing the role of ICTs for Disaster Risk Management (DRM)

INTRODUCTION

Disasters cause huge economic losses. According to the World Bank, disasters threatened the GDPs of all the Least Developed Countries and more than 60 developing countries. In a small developing country, even a single medium-size disaster can reverse economic development. In a matter of minutes or hours, rapid-onset catastrophic disasters like earthquakes, tsunamis, flash floods and volcanoes can destroy the hard-earned development gains of decades or even centuries. Within the Asia-Pacific region, South-East Asia, in particular Indonesia and the Philippines were hardest hit. The underlying reasons appear to be unplanned urbanization, poor management of land use and climate change.[1]

Dealing with the aftermath of any type of a disaster has many aspects. Each group of actors from government entities to the private sector, to community groups and the general public have roles to play. The lack of organized support services and access to infrastructure makes response and recovery a daunting task.

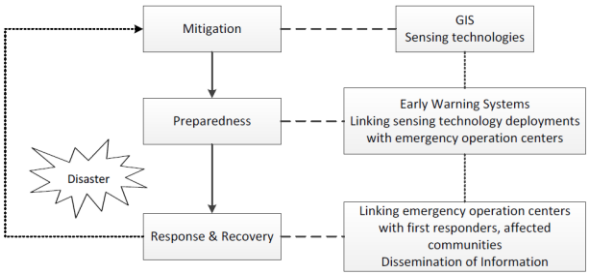
For instance, when disasters occur in rural areas where access to transport and communication is poor, it is harder to respond in a timely manner, and timely response is critical.

What governments can do is to reduce the risks posed by disasters to the lives and livelihoods of citizens. With advances made in technology, the sophistication of systems currently in place and the rapid pace at which new technologies and solutions emerge, Information and Communication Technology (ICT) is proving to be an increasingly important tool in Disaster Risk Management (DRM).

Note: AP-IS in the title is an abbreviation of Asia-Pacific Superhighway Initiative

Figure1: Examples of ICT applications at key stages of a disaster

[1] Asia-Pacific Disaster Report 2019 : https://www.unescap.org/publications/asia-pacific-disaster-report-2019



In its simplest form, ICTs are useful in all stages of the disaster lifecycle (Figure 1). In situations of emergency, ICTs provide the necessary platform to keep communication channels open, given the underlying infrastructure is available. The following sections briefly assess the use of ICTs in all aspects of the disaster lifecycle and look at good practices and emerging technologies that can be used for building e-resilience in the region.

INCORPORATING ICT IN THE DISASTER MANAGEMENT LIFECYCLE: THE PHILIPPINES CASE

The Philippines is a case in point where ICTs have been incorporated in all stages of the disaster management lifecycle with joint collaborative work of various government agencies.

1. Disaster Prevention and Mitigation: The Department of Science and Technology (DOST) to provide high-resolution flood hazard maps of 18 major river basins in Philippines. These maps are used for emergency response and disaster preparedness. To compliment the map, low-power devices are also used to gather data from the field.

2. Disaster Preparedness: The Office of Civil Defense' Disaster Information for National Awareness to inform the public of the measures (via audio–visual presentations) that need to be taken before, during and after a disaster. Weather forecast agency has upgraded FTP (File Transfer Protocol) server with high availability platform that links forecast and warning systems. Through this, it issues local forecasts/warnings via its regional centers. The National Cell Broadcast System for the Public was established to allow sending real-time location-specific information messages to a large number of telecom subscribers.

3. Disaster Response: The National Disaster Risk Reduction and Management Council (NDRMC)'s Intelligent Operations Center (IOC) provides a communication facility that consists of an operational building and a vehicle with emergency communication equipment to respond to disasters. Government Emergency Communication Program tracks, exchanges and uses critical information prior to, during and after a natural disaster.

4. Disaster Recovery: The Foreign Aid Transparency Hub and the Track Recovery System are used to make communities aware on the expenditure of funds for disaster recovery. iGovPhil provides infrastructure and support services for e-Governance. The infrastructure of iGovPhil includes the government data centers and fiber optic networks to connect government offices to provide high-speed communication for the purpose of sharing tasks and data during a disaster recovery situation.

MOBILE NETWORK BIG DATA (MNBD) FOR DRM

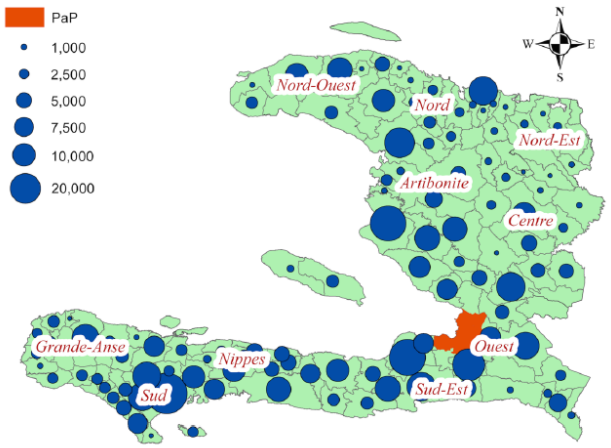
In developing economies, MNBD currently represents the single most important source of Big Data for development purposes, due to its almost comprehensive coverage of the population. This makes citizens, sensors, and the resultant data derived from mobile phone usage – a useful source of insights for development policy.

Mobile phone users generate a multitude of high frequency and temporally granular location data whenever they use their phones. Regular mobility patterns can be established relatively easily from phone events such as outbound and inbound calls/SMS-es/MMS-es and mobile internet sessions, especially when one considers data covering even a month of activity. These can give insights not just on cross-regional travel volumes but also broader mobile

patterns in inter- and intra-regional travel. Using such insights, it is possible to then establish mobility hubs, population sources and sinks, and the resultant population flows over varying temporal periods. Such data can be useful also to understand how people respond when there are external shocks.

Mobility data from MNBD can show population displacements after a disaster. Such insights allow first responders and relief agencies to quickly locate affected populations and improve their targeting of aid and scarce resources. In one retrospective study using CDR data from Haiti, the researchers showed the new locations of the former residents of Port-au-Prince who were displaced when the 2010 earthquake levelled their city (see Box 2).

Box 2: Using MNBD to locate displaced persons in Haiti39



Post-earthquake distribution of Port au Prince (Haiti) population after the 2010 earthquake: The figure shows the number of people estimated to have been in Port-au-Prince (PaP) on the day of the 2010 Haiti earthquake, but outside the capital 19 days later. The circles represent the numbers of people who were displaced.

MNBD has also been used in the health sector to understand phenomena such as the propagation of vector-borne diseases through the human migration. Research in Kenya combined passive mobile positioning data from CDRs with malaria prevalence data to identify the source and spread of infections.

UNMANNED AERIAL VEHICLES (UAV) FOR DRM

Also known as drones, UAVs have, in recent times, become more commonly used for DRM purposes, mainly in the response and recovery phase. Their aerial view imagery provides insights on the extent of the damage and, when outfitted with thermal imaging cameras, can help identify bodies trapped under debris. In areas of severe damage where transport links have been destroyed and are unreachable or are hazardous to first responders, drones provide a way of assessing the situation on the ground relatively fast.

Compared to satellite imagery, UAVs are a more cost-effective solution that can be launched by individuals or by affected communities. They can, therefore, be used as a tool for disaster preparedness and make communities more resilient.

SMART GRIDS FOR DISASTER RISK REDUCTION

Smart grid integrates ICTs into electricity generation, delivery and consumption to reduce the impact on the environment, improve the market system, quality of service provision and improve the efficiency of the system.

One example is the Tagonishi city, which is recognized as a role model to make cities resilient and to promote community-based DRR by collaborating in private-public partnership. The ICT devices in the houses in this city visualize electricity consumption by fitting to its solar power systems, storage battery units, gas cogeneration systems and other equipment. This system has a two-way communication between each device and the energy management system. It facilitates efficient management of energy consumption in its five power sources. In the event of a disaster, it can rely on its own power sources. It is energy self-sufficient and it consists of anti-liquefaction measures at an event of a disaster. The city buildings have built-in disaster countermeasures such as smart grids, evacuation shelters, renewable energy sources, and emergency electricity supply systems.

CHALLENGES FACED

Prior to discussing the pathways to improve the state of the art in using new sources of data for assisting in predicting emerging trends and shocks as well as for building greater resilience, the more immediate concern is how to make such data accessible to researchers, planners, and others for public purposes. As privately-owned data, they are not very amenable to the open data initiatives that are currently popular in the public discourse.

There are also privacy concerns that emanate from such data sharing. Further, there are potential competitive implications for operators should their data be shared (even after anonymization). The result of these privacy and competitive concerns are that service providers are generally reluctant to share their data.

The question then is how to facilitate greater data sharing by service providers for public purposes, while accounting for concerns related to privacy and competition? As a regulated industry, MNOs operate under a license, which could theoretically be argued, is a form of concessionary contract to deliver a public service, and as such, licenses could theoretically include provisions for data sharing. An alternate and less intrusive approach is to develop bottom-up, pragmatic, cooperative arrangements with government and private actors.

PROPOSALS FOR STRENGTHENED REGIONAL RESPONSES

Given the potential and significant role ICTs play in the DRM space, the resilience of ICTs must be given due consideration. In most cases network providers inherently incorporate redundancy into their network roll-out plans. However, it is good practice to ensure necessary levels of resilience have been built into the networks both within the country and on links connecting the international gateways. Network topologies do matter: for instance, mesh networks theoretically provide multiple points of redundancy when compared to other network topologies.

At the national level, governments should engage in active participation of regional efforts in creating conducive environments for sustainable and resilient environments. All aspects of development planning ought to integrate DRR into the planning process. To facilitate this, an enabling environment for greater cooperation among different government entities needs to be created, keeping in mind the type of vertical and horizontal integration that is required, including local governments and community organizations. Taking into account technological innovations such as Big Data that can really enhance current DRM practices, governments should consider opening up data that can also benefit those responsible for disaster response.

At a regional level, it is recommended that international organizations assess and thereafter act upon concepts such as risk pooling that can benefit smaller economies in risk mitigation. Such organizations should also support the use of emerging technologies and the creation of knowledge centers which will also greatly benefit economies that currently do not have the technical expertise required to utilize available ICTs. International organizations can also facilitate better developmental planning to assist in governments' understanding and thereafter actions addressing critical interdependencies and the building in resilience in all vital infrastructures.

Access the Gateway on
www.drrgateway.net

Launched by the ESCAP resolution 73/6 in 2017, the Asia-Pacific Information Superhighway (AP-IS) initiative aims to increase the availability and affordability of broadband connectivity across Asia and the Pacific through four pillars: (1) physical infrastructure development; (2) Internet traffic and network management; (3) promoting e-resilience and (4) broadband for all. The AP-IS Policy Brief Series is designed to deliver key messages emanating from the analytical research conducted by the ESCAP secretariat and AP-IS partners for member countries' informed decision making.